

WHAT IS CLAIMED is:

1. An automatic transmission system comprising:
 - a first input shaft connected to an internal combustion engine;
 - 5 a first transmission gear train, gears of said first transmission gear train being each disconnectable, installed on said first input shaft;
 - a second input shaft;
 - 10 a second transmission gear train, gears of said second transmission gear train being each disconnectable, installed on said second input shaft;
 - an output shaft connected commonly to each driven gear train of said first transmission gear train and second transmission gear train;
 - 15 a motor to apply torque relatively between said first input shaft and second input shaft; and
 - a control equipment to control the torque and rotational speed of said motor and connection/disconnection of said first and second transmission gear trains.
- 20 2. An automatic transmission system according to Claim 1, wherein a differential gear is provided between said first input shaft and second input shaft and said motor is connected to said third shaft of said differential gear.

3. An automatic transmission system according to
Claim 1, wherein

a planetary gear is provided;

said first shaft of said planetary gear is
5 connected to the first input shaft;

said second shaft of said planetary gear is
connected to the second input shaft; and

said third shaft of said planetary gear is
connected to the motor.

10 4. An automatic transmission system according to
Claim 1, wherein each gear ratio of said second
transmission gear train is set to a half-position of
the gear ratio of said first transmission gear train.

5. An automatic transmission system according to
15 Claim 1, wherein

said second transmission gear of said second
transmission gear train is connected while the system
being driven by said first transmission gear of said
first transmission gear train;

20 the transmitting torque of said first transmission
gear is decreased by increasing said second input
shaft torque by the motor;

said first transmission gear is disconnected when
the transmitting torque of said first transmission
25 gear becomes nearly zero;

the rotational speed of said first input shaft is set closer to that of said third transmission gear of said first transmission gear train, while maintaining the second input shaft torque by said motor; and

5 when the rotational speed of the first input shaft has synchronized with that of the third transmission gear, the third transmission gear with the first input shaft is connected, and also the generated torque of the motor is set to zero and the second transmission
10 gear is disconnected

6. An automatic transmission system according to Claim 1, wherein

15 said second transmission gear of said second transmission gear train is connected, while being driven by said first transmission gear of said first transmission gear train;

 said transmitting torque of said first transmission gear is decreased by increasing the second input shaft torque by said motor;

20 said first transmission gear is disconnected when the transmitting torque of said first transmission gear becomes nearly zero;

 the rotational speed of the first input shaft is set closer to the rotational speed of said third transmission gear of said first transmission gear

train, while maintaining the second input shaft torque by the motor; and

when the rotational speed of said first input shaft has synchronized with that of the third transmission gear, said third transmission gear with said first input shaft is connected, and also the generated torque of the motor is set to zero and said second transmission gear is disconnected.

7. An automatic transmission system according to
10 Claim 1, wherein

said second transmission gear of said second transmission gear train is connected, while being driven by said first transmission gear of said first transmission gear train;

15 the transmitting torque of said first transmission gear is decreased by increasing the second input shaft torque by said motor;

said first transmission gear is disconnected when the transmitting torque of said first transmission gear becomes nearly zero;

the rotational speed of the first input shaft according to the automobile speed to drive the automobile is continuously varied, while maintaining the second input shaft torque by said motor; and

25 when the rotational speed of the first input shaft

has synchronized with that of the third transmission gear of the first transmission gear train, said third transmission gear is connected with the first input shaft, and the generated torque of said motor is set 5 to zero and said second transmission gear is disconnected.

8. An automatic transmission system according to Claim 1, wherein

10 said second transmission gear of said second transmission gear train is disconnected while being driven by said first transmission gear of said first transmission gear train;

15 the transmitting torque of said first transmission gear is decreased by increasing said second input shaft torque by said motor;

 said first transmission gear is disconnected when the transmitting torque of said first transmission gear becomes nearly zero;

20 the rotational speed of said first input shaft is maintained near the rotational speed of said second transmission gear of said second transmission gear train to drive the automobile, while maintaining the second input shaft torque by said motor; and,

25 the rotational speed of the first input shaft is set closer to that of the third transmission gear of

the first transmission gear train to stop
transmission; and

5 said third transmission gear is connected with
said first input shaft when the rotational speed of
the first input shaft has synchronized with that of
said third transmission gear, and the generated torque
of said motor is set to zero and said second
transmission gear is disconnected.

9. An automatic transmission system comprising:
10 a first input shaft connected to an internal
combustion engine;
 a first transmission gear train installed on the
first input shaft;
 a first output shaft equipped with a driven gear
15 train that connects with said first transmission gear
train;
 a second input shaft;
 a second transmission gear train installed on said
second input shaft;
20 a second output shaft equipped with a driven gear
train that connects with the second transmission gear
train,
 a first final drive gear installed on the first
output shaft,
25 a second final drive gear installed on the second

output shaft,

a final driven gear that commonly engages with
said first and second final drive gears,

5 a motor to apply torque relatively between said
first input shaft and second input shaft; and
a control equipment controlling the torque and
rotational speed of said motor and
connection/disconnection of said first and second
transmission gear trains.

10 10. An automatic transmission system according to
Claim 9, wherein the gear ratio of the second final
drive gear, which is installed on the second output
shaft and engages with said final driven gear, is
smaller than that of said first final drive gear.

15 11. An automatic transmission system according to
Claim 9, wherein

a differential gear is provided between said fist
input shaft and second input shaft; and
said motor is connected to said third shaft of
20 said differential gear.

12. An automatic transmission system according to
Claim 9, wherein
a planetary gear is provided;
a fist shaft of the planetary gear is connected to
25 said first input shaft;

a second shaft of the planetary gear is connected to said second input shaft; and

a third shaft of the planetary gear is connected to said motor.

5 13. An automatic transmission system according to Claim 9, wherein each gear ratio of said second transmission gear train is set to a half-position of the gear ratio of said first transmission gear train.

10 14. An automatic transmission system according to Claim 9, wherein

said second transmission gear of said second transmission gear train is connected while the system being driven by said first transmission gear of said first transmission gear train;

15 the transmitting torque of said first transmission gear is decreased by increasing the second input shaft torque by said motor;

20 said first transmission gear is disconnected when the transmitting torque of the said transmission gear becomes nearly zero;

the rotational speed of said first input shaft is set closer to that of said third transmission gear of said first transmission gear train, while maintaining the second input shaft torque by said motor; and

25 when the rotational speed of said first input

shaft has synchronized with that of said third transmission gear, said third transmission gear with said first input shaft is connected, and the generated torque of said motor is set to zero and said second transmission gear is disconnected.

5 15. An automatic transmission system according to Claim 9, wherein

10 said second transmission gear of said second transmission gear train is connected, while being driven by said first transmission gear of said first transmission gear train;

the transmitting torque of the first transmission gear is decreased by increasing the second input shaft torque by said motor;

15 said first transmission gear is disconnected when the transmitting torque of said first transmission gear becomes nearly zero;

20 the rotational speed of the first input shaft is set closer to the rotational speed of the third transmission gear of said first transmission gear train, while maintaining the second input shaft torque by the motor; and

25 when the rotational speed of the first input shaft has synchronized with that of the third transmission gear, said third transmission gear is connected with

the first input shaft, and the generated torque of the motor is set to zero and said second transmission gear is disconnected.

16. An automatic transmission system according to
5 Claim 9, wherein

said second transmission gear of said second transmission gear train is connected, while being driven by said first transmission gear of the first transmission gear train;

10 the transmitting torque of said first transmission gear is decreased by increasing the second input shaft torque by said motor,

said first transmission gear is disconnected when the transmitting torque of said first transmission gear becomes nearly zero;

the rotational speed of said first input shaft according to the automobile speed to drive the automobile is varied continuously, while maintaining the second input shaft torque by said motor; and

20 when the rotational speed of the first input shaft has synchronized with that of the third transmission gear of the first transmission gear train, the third transmission gear with the first input shaft is connected, and the generated torque of the motor is
25 set to zero and said second transmission gear is

disconnected.

17. An automatic transmission system according to
Claim 9, wherein

said second transmission gear of the second
5 transmission gear train is connected, while being
driven by said first transmission gear of said first
transmission gear train;

the transmitting torque of the first transmission
gear is decreased by increasing the second input shaft
10 torque by said motor;

said first transmission gear is disconnected when
the transmitting torque of said first transmission
gear becomes nearly zero;

the rotational speed of said first input shaft
15 maintained near the rotational speed of said second
transmission gear of said second transmission gear
train to drive the automobile, while maintaining the
second input shaft torque by said motor; and,

the rotational speed of the first input shaft is
20 set closer to that of the third transmission gear of
the first transmission gear train to stop
transmission; and

said third transmission gear is connected with
said first input shaft, when the rotational speed of
25 the first input shaft has synchronized with that of

the third transmission gear, and the generated torque of the motor is set to zero and said second transmission gear is disconnected.

18. An automobile equipped with an internal combustion engine, automatic transmission, and control equipment that controls the internal combustion engine and automatic transmission; wherein
 - 5 the automatic transmission comprises:
 - a first input shaft connected to the internal combustion engine;
 - 10 a first transmission gear train, of which gears are each disconnectable, installed on the first input shaft,
 - a second input shaft;
 - 15 a second transmission gear train, of which gears are each disconnectable, installed on the second input shaft;
 - 20 an output shaft connected commonly to each driven gear train of the first transmission gear train and second transmission gear train; and
 - a motor that applies torque relatively between the first input shaft and second input shaft; and
 - said control equipment connects the second transmission gear of the
 - 25 second transmission gear train, while the system being

driven by the first transmission gear of the first transmission gear train;

decreases the transmitting torque of the first transmission gear by increasing the second input shaft torque by the motor;

disconnects the first transmission gear when the transmitting torque of the first transmission gear becomes nearly zero;

sets the rotational speed of the first input shaft closer to that of the third transmission gear of the first transmission gear train, while maintaining the second input shaft torque by the motor; and

when the rotational speed of the first input shaft has synchronized with that of the third transmission gear, connects the third transmission gear with the first input shaft, and also sets the generated torque of the motor to zero and disconnects the second transmission gear.

19. An automobile equipped with an internal combustion engine, automatic transmission, and control equipment that controls the internal combustion engine and automatic transmission; wherein
the automatic transmission comprises:
a first input shaft connected to the internal
combustion engine;

a first transmission gear train installed on said
first input shaft;

5 a first output shaft equipped with a driven gear
train that connects with the first transmission gear
train;

a second input shaft,

a second transmission gear train installed on the
second input shaft,

10 a second output shaft equipped with a driven gear
train that connects with the second transmission gear
train;

an output shaft equipped with a driven gear train
that connects with the first transmission gear train
and second transmission gear train;

15 a first final drive gear installed on the first
output shaft;

a second final drive gear installed on the second
output shaft;

20 a final driven gear that commonly engages with the
first and second final drive gears; and

a motor that applies torque relatively between
said first input shaft and second input shaft; and

said control equipment connects the second
transmission gear (or corresponding second driven
25 gear) of the second transmission gear train, while the

system being driven by the first transmission gear of
the first transmission gear train,

decreases the transmitting torque of the first
transmission gear by increasing the second input shaft
5 torque by the motor,

disconnects the first transmission gear when the
transmitting torque of the first transmission gear
becomes nearly zero,

sets the rotational speed of the first input shaft
10 closer to that of the third transmission gear of the
first transmission gear train, while maintaining the
second input shaft torque by the motor, and

when the rotational speed of the first input shaft
has synchronized with that of the third transmission
15 gear, connects the third transmission gear with the
first input shaft (or the corresponding third driven
gear with the first output shaft), and also sets the
generated torque of the motor to zero and disconnects
the second transmission gear.

20. An automatic transmission system comprising:

a first input shaft connected to an internal
combustion engine;

a first transmission gear train, gears of said
first transmission gear train being each

25 disconnectable, installed on the first input shaft;

a second input shaft;

a second transmission gear train, gears of said second transmission gear train being each disconnectable, installed on said second input shaft;

5 an output shaft connected commonly to each driven gear train of said first transmission gear train and second transmission gear train;

a motor to apply torque relatively between said first input shaft and second input shaft;

10 of which system connects the second transmission gear of the second transmission gear train, while the system being driven by the first transmission gear of the first transmission gear train;

decreases the transmitting torque of the first

15 transmission gear by increasing the second input shaft torque by the motor;

disconnects the first transmission gear when the transmitting torque of the first transmission gear becomes nearly zero;

20 sets the rotational speed of the first input shaft closer to that of the third transmission gear of the first transmission gear train, while maintaining the second input shaft torque by the motor, and

when the rotational speed of the first input shaft

25 has synchronized with that of the third transmission

gear, connects the third transmission gear with the first input shaft, and also sets the generated torque of the motor to zero and disconnects the second transmission gear.

- 5 21. An automatic transmission system comprising:
 - a first input shaft connected to an internal combustion engine;
 - a first transmission gear train installed on said first input shaft;
- 10 a first output shaft equipped with a driven gear train that connects with said first transmission gear train;
- 15 a second input shaft;
- a second transmission gear train installed on said second input shaft;
- a second output shaft equipped with a driven gear train that connects with the second transmission gear train;
- 20 an output shaft equipped with a driven gear train that connects with the first transmission gear train and second transmission gear train;
- a first final drive gear installed on said first output shaft;
- a second final drive gear installed on said second output shaft;

a final driven gear that commonly engages with said first and second final drive gears, and a motor that applies torque relatively between the first input shaft and second input shaft;

5 of which system connects the second transmission gear (or corresponding second driven gear) of the second transmission gear train, while the system being driven by the first transmission gear of the first transmission gear train,

10 decreases the transmitting torque of the first transmission gear by increasing the second input shaft torque by the motor,

disconnects the first transmission gear when the transmitting torque of the first transmission gear 15 becomes nearly zero,

sets the rotational speed of the first input shaft closer to that of the third transmission gear of the first transmission gear train, while maintaining the second input shaft torque by the motor, and

20 when the rotational speed of the first input shaft has synchronized with that of the third transmission gear, connects the third transmission gear with the first input shaft (or the corresponding third driven gear with the first output shaft), and also sets the 25 generated torque of the motor to zero and disconnects

the second transmission gear.